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DEVELOPMENT OF FERMENTED WATER KEFIR AMARANTH DRINK

by

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A dissertation submitted in partial fulfillment of the requirement for the degree of
Bachelor of Technology (B. Tech) in the field of Food Technology
School of Industrial Technology
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DECLARATION BY AUTHOR

This dissertation is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. The content of my dissertation is the result of work I have carried out since the commencement of my research project and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution.

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JULY 2020

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CHIN WEN YI

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LIST OF ABBREVIATIONS

Abbreviation	Caption
ºC	Degree Celsius
α	alpha
β	beta
µm	micrometer
µL	microliter
AOAC	Association of Official Analytical Chemists
ANOVA	Analysis of Variance
BGLB	Brilliant Green Bile Agar
CaEDTA	Calcium disodium edetate
CFU	Colony Forming Unit
CFU/mL	Colony Forming Units per milliliter
EC	*Escherichia coli* Broth
EMB	Eosin Methylene Blue Agar
g	gram
GC5	Fermented green amaranth without water kefir grains with 5% brown sugar
GC7	Fermented green amaranth without water kefir grains with 7% brown sugar
GK5	Fermented green amaranth with water kefir grains with 5% brown sugar
GK7	Fermented green amaranth with water kefir grains with 7% brown sugar
HPLC	High-performance liquid chromatography

hr	hour
L	liter
LST	Lauryl Tryptose Broth
M	molarity
min	minute
mg	milligram
mg GAE/100g	milligram of gallic acid equivalents per 100 g
mL	milliliter
mL/min	milliliter per minute
mm	millimeter
mmHg	millimeter of mercury
MPN	Most probable number
MRS	De man, Rogosa, Sharpe Agar
Na_2CO_3	sodium carbonate
NaOH	sodium hydroxide
PCA	Plate Count Agar
PDA	Potato Dextrose Agar
RC5	Fermented red amaranth without water kefir grains with 5% brown sugar
RC7	Fermented red amaranth without water kefir grains with 7% brown sugar
RK5	Fermented red amaranth with water kefir grains with 5% brown sugar
RK7	Fermented red amaranth with water kefir grains with 7% brown sugar

UV-Vis	Ultraviolet-visible
w/v	mass/volume

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PENGHASILAN MINUMAN KEFIR AIR BAYAM

ABSTRAK

Tujuan kajian ini adalah untuk menghasilkan minuman kefir air dari jus bayam sebagai alternatif untuk vegetarian dan pengguna yang mempunyai intoleransi laktosa bagi menggantikan minuman berasas susu haiwan. Pelbagai analisis telah dijalankan ke atas minuman kefir air bayam merah (*Amaranthus tricolor*) dan bayam hijau (*Amaranthus blitum*) yang difermentasi dengan tahap gula (5% dan 7%) yang terpilih. Kedua-dua minuman kefir air bayam merah dan hijau mencapai penurunan signifikan ($p<0.05$) dalam nilai pH, jumlah pepejal larut dan tahap sukrosa menunjukkan proses fermentasi yang berkesan. Minuman kefir air bayam merah yang difermentasi menggunakan 5% tahap gula menunjukkan peningkatan signifikan ($p<0.05$) dalam aktiviti antioksidan dan kandungan jumlah fenolik telah mengenal pastikan kandungan nutritisi yang tinggi. Kedua-dua minuman kefir air bayam merah dan hijau dapat klaim properti probiotik disebabkan pencapaian minima 10^6 CFU/mL lactobacilli lepas 2 minggu penyimpanan. Keputusan dari analisis mikrobiologi telah menunjukkan lactobacilli (13.39×10^6 CFU/mL) dan yis dan kulat (25.23×10^6 CFU/mL) dalam minuman kefir air bayam merah yang difermentasi menggunakan 7% tahap gula jauh lebih tinggi berbanding bayam hijau. Kedua- dua sampel mempunyai kandungan coliform yang dalam julat selamat dan ketiadaan coliform fecal telah menunjukkan kualiti mikrobiologi yang stabil. Namun begitu, jus bayam merah dan hijau tidak sepenuhnya sesuai sebagai substrat minuman kefir air disebabkan keasidan tertitrat dan kiraan sel boleh hidup yang rendah. Kesimpulannya, minuman kefir air bayam merah dan bayam hijua telah berjaya dihasilkan.

DEVELOPMENT OF FERMENTED WATER KEFIR AMARANTH DRINK

ABSTRACT

The aim of this study is to develop fermented water kefir drink from vegetable amaranth juice as an alternative for vegetarians and lactose intolerants to replace dairy beverages. Various analyses were conducted on fermented water kefir red amaranth (*Amaranthus tricolor*) and green amaranth (*Amaranthus blitum*) drinks fermented with selected sugar levels (5% and 7%). Both fermented red and green amaranth samples with 7% sugar achieved significant ($p<0.05$) decrement in pH value, total soluble solids, and sucrose concentration which represented efficient water kefir fermentation. Fermented red amaranth sample showed significant ($p>0.05$) increment in antioxidants activity and total phenolic content after fermentation represented higher nutritional value. Both fermented red and green amaranth samples were able to claim probiotic properties due to the achievement of minimum 10^6 CFU/mL of lactobacillus after 2 weeks of storage. Results from microbiological analyses showed a significantly ($p<0.05$) higher lactobacilli count (13.39×10^6 CFU/mL) and yeast and mold count (25.23×10^6 CFU/mL) in fermented red amaranth drink with 7% sugar level compared to green amaranth. Both samples had acceptable range of coliform count and absence of fecal coliforms represented the stable microbial quality. However, red and green amaranth vegetable juice were not fully suitable to use as water kefir substrate due to low titratable acidity and total viable cell count. As an overall, fermented red and green amaranth water kefir drinks were successfully produced.